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CURRENT LITERATURE.

BOOK REVIEWS.

Influence of light and darkness.

THE RELATION of light to the growth and development of plants has been the subject of much study and experimental research for two centuries or more. Probably the largest contribution to the general knowledge of the subject, at least to the text-book literature, has been made by Sachs, aided by his pupils. He began publication in 1859, and exerted great influence in molding scientific opinion in this as in other parts of the science of plant physiology. As researches have multiplied and the subject has unfolded, the difficulty of making a satisfactory explanation of observed phenomena has increased.

A careful examination of the whole subject, coupled with observations upon a series of plants of wide relationship and diverse habits, has been much needed. A monographic work of this character has recently been published by Dr. D. T. MacDougal,¹ director of the laboratories of the New York Botanical Garden. It has been the aim of the author to secure ample facts with which to survey the whole field, and the substantial volume before us is evidence of success.

The work opens with a résumé of previous contributions, in which more than a hundred works are summarized in a lucid and critical manner. The author then records his own observations, giving an account of experiments on ninety-seven species of flowering plants, ferns and their allies, which have been grown in continual darkness, with control plants grown in light. The subjects were grown from tubers, corms, rhizomes, cuttings of leaves and stems, seeds, and spores. They represent aquatics, creepers, climbers, succulents, mycorrhizal forms, geophilous and aerial shoots, mesophytes, and spiny xerophytes. The work has extended over a period of seven years, and embraces a wealth of data not readily apprehended without detailed examination. The great number of excellent original illustrations adds interest and value to the treatise.

A third of the volume is occupied with a discussion of the data, and their correlation with previous observations and conclusions. The matter is taken up from various points of view, and it is clearly shown that no theories heretofore propounded will apply to all cases. Although occasionally plants have acquired certain advantages through etiolation, the forms assumed in dark-

¹ MACDOUGAL, DANIEL TREMBLY, *The influence of light and darkness upon growth and development. Memoirs of the New York Botanical Garden, II.* Imp. 8vo. pp. 319, *f*gs. 176. New York Botanical Garden. 1903. \$2.00.

ness are not, as usually held, due to an effort on the part of the plant to reach the light. It is shown that the stimulating action of light may be transmitted through a considerable interval of both space and time, even affecting organs subsequently formed, so that conclusions drawn from so-called "partial etiolation" have frequently been erroneous. Often there is a direct action of darkness in producing morphological changes. It is well proven that in all cases a great difference exists in the morphological differentiation of tissues developed in darkness and in light, and in this discussion the distinction between growth and development is kept clearly in view. The author concludes that "none of the phenomena of etiolation or of diminished growth in light may be ascribed to the direct influence of light upon the tissues or cells concerned, but rather upon the organism as a whole."

It is, however, impossible to give in a brief review any adequate idea of the author's views upon the various aspects of the subject. He himself has tacitly admitted the futility of such an attempt by not providing a summary for the reader.

There can be no question of the great value of this contribution by Dr. MacDougal to a most important part of plant physiology. The vast array of carefully planned observations forms a substantial contribution in itself and the discussion brings the subject into a new and clearer light. An ample index both to the literature cited and to the text and illustrations completes the volume.—J. C. ARTHUR.

The heaths of northern Germany.

THE FIFTH volume of *Vegetation der Erde* differs from those that have preceded in that a single formation is dealt with, rather than a country or a natural phytogeographic subdivision. Graebner² has made the north German heaths a special study for a number of years, and in 1895 he published an extensive treatise on the subject, wherein many of his present results were anticipated. The close relationship between heaths and moors is clearly shown, and the impossibility of using the water content of the soil as the chief distribution factor is well brought out. Graebner makes a strong plea (as he has done in former papers) for a chemical classification of soils and plant formations. Adopting this idea, the heath belongs to the soil group which is poor in certain food materials, particularly potash, lime, and phosphoric acid. For chemical reasons, he believes that a heath soil can never develop a natural forest. The author's concept of the heath is rather broad, including not only areas dominated by ericaceous shrubs, but open tracts in which there is neither a good tree growth nor a close grass turf; ligneous plants dominate, especially low shrubs. What we call pine or oak barrens would probably be included in Graebner's heath. Moors or peat bogs also are difficult to delimit from the heath, many species, indeed, being common to both.

²GRAEBNER, P., *Die Heide Norddeutschlands und die sich anschliessenden Formationen in biologischer Betrachtung*. 8vo, pp. xii + 320. With map. Leipzig: Wilhelm Engelmann. 1901. Price M 21.50.